

Study of Serum Uric Acid and Vitamin D Levels in Essential Hypertension.

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Received: January 2020

Accepted: January 2020

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ABSTRACT

Background: Hypertension or increase in blood pressure has been considered as one of the leading factors in causing worldwide disability. There is an association between serum uric acid levels and vitamin D levels and the risk of hypertension. Aim: To examine serum uric acid and vitamin D level in patients with essential hypertension and their role in etiopathogenesis of essential hypertension. **Methods:** This case control hospital based study included 100 essential hypertension patients and 100 normal subjects without essential hypertension attending medicine outpatient department of Guru Nanak Dev Hospital, Amritsar and fulfilling the inclusion and exclusion criteria of the study. Blood sample from the study and control group was drawn under full aseptic precautions, and was further evaluated for various investigations. **Results:** The mean serum vitamin D level of patients in hypertension group is 20.97 ng/mL and mean serum vitamin D levels of control group is 38.69 ng/mL. Mean serum vitamin D level of hypertension group is significantly lower than the control group. The mean serum uric acid levels of patients in hypertension group and control group are 6.25 mg/dL and 5.08 mg/dL. Mean serum uric acid level of hypertension group is significantly higher than the control group. **Conclusion:** Essential hypertension is associated with abnormalities in the levels of serum uric acid and Vitamin D.

Keywords: Blood pressure, Essential hypertension, Serum uric acid, Vitamin D.

INTRODUCTION

Hypertension or increase in blood pressure has been considered as one of the leading factors in causing worldwide disability.^[1] A recent report on the global burden of hypertension indicates that nearly 1 billion adults had hypertension in 2000 and this is predicted to increase to 1.56 billion by 2025.^[2] In India, awareness of hypertension and its complications is very poor. Poor awareness of normal blood pressure values in hypertension is an important factor hindering blood pressure control.^[3] Hypertension has many etiological factors, which include age, race, family history, obesity, sedentary lifestyle, using tobacco, high salt intake, stress and consuming alcohol in a larger quantity.^[4]

Uric acid has been implicated in hypertension through the probable role. It is thought to play a role in mediating hypertension via mechanisms like inflammation, vascular smooth muscle cell proliferation in renal microcirculation, endothelial

dysfunction and activation of renin-angiotensin aldosterone system.^[5]

Vitamin D plays a key role in regulation of blood pressure and in the pathogenesis of hypertension through its effects on calcium homeostasis, vascular smooth muscle, endothelial cells and activity of renin-angiotensin aldosterone system.^[6]

Due to the continued interest and lack of information on serum uric acid levels as well as vitamin D levels and the risk of hypertension, this study was conducted to examine serum uric acid and vitamin D level in patients with essential hypertension and their role in etiopathogenesis of essential hypertension.

MATERIALS AND METHODS

This case control hospital based study included 100 essential hypertension patients and 100 normal subjects without essential hypertension attending medicine outpatient department of Guru Nanak Dev Hospital, Amritsar and fulfilling the inclusion and exclusion criteria of the study. The study was conducted after approval from institutional thesis and ethical committee.

Inclusion Criteria

1. Hundred essential hypertension patients attending General Medicine Out Patient Department, Govt. Medical College, Amritsar.

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2. Hundred normal subjects without essential hypertension between the age group of 25-75 years.

Exclusion Criteria

1. Patients with secondary hypertension and complications of cardiovascular, renal disorders and stroke.
2. History of multiple blood transfusions and renal disease.
3. Pregnancy, anaemia and history of any other medical or surgical illness.

Control group:

Normal volunteers in the age group of 25-75 years were screened for same parameters which were done for cases.

Method of Collection of Data

Blood sample from the study and control group was drawn under full aseptic precautions, after obtaining informed consent.

All the cases were investigated for:

- CBC (complete blood count)
- FBS (fasting blood sugar)
- RBS (random blood sugar)
- HbA1c
- Fasting lipid profile
- Renal function test: Blood urea, Serum creatinine
- Liver function tests
- Ultrasound abdomen
- Electrocardiogram
- Serum uric acid level
- Serum vitamin D level

Patients were diagnosed to have hypertension on the basis of American Heart Association 2017 guidelines.^[15]

Statistical Analysis

The data was collected systematically and tabulated. For data analysis SPSS version 22 was used. Chi square test and t – test were used to check the significance between the two groups.

RESULTS

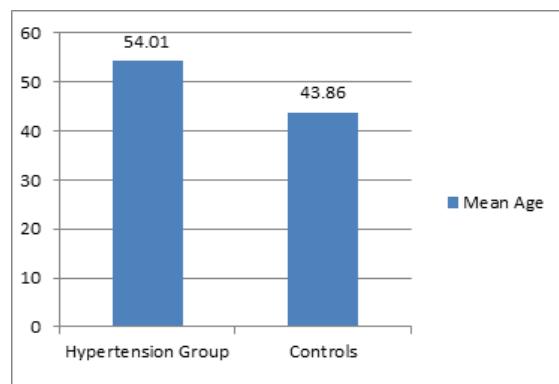


Figure 1: Mean Age (In Years)

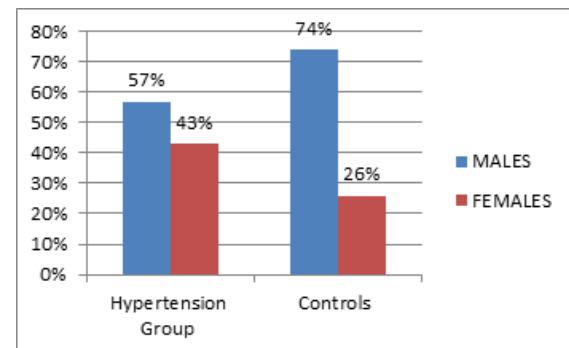


Figure 2: Gender Distribution

Table 1: Comparison of mean values of various variables in two groups

Variable	Hypertension Group (mean±SD)	Controls (mean±SD)	P – Value
FBS (mg/dL)	87.19 ± 8.10	85.73 ± 8.62	0.10
HbA1C (%)	5.96 ± 0.29	5.89 ± 0.35	0.17
Serum Bilirubin (mg/dL)	0.72 ± 0.25	0.71 ± 0.28	0.87
SGOT (U/L)	31.8 ± 6.63	28.99 ± 5.91	0.0018
SGPT (U/L)	30.86 ± 6.56	29.25 ± 5.76	0.06
HDL (mg/dL)	45.00 ± 6.63	46.12 ± 7.91	0.27
LDL (mg/dL)	103.15 ± 12.79	101.32 ± 14.02	0.33
Triglyceride (mg/dL)	138.68 ± 31.16	131.63 ± 21.81	0.06
Urea (mg/dL)	25.24 ± 6.66	23.29 ± 5.72	0.02
Serum Creatinine (mg/dL)	0.71 ± 0.19	0.66 ± 0.23	0.09
Serum Vitamin D (ng/mL)	20.97 ± 7.95	38.69 ± 32.91	0.0001
Serum Uric Acid (mg/dL)	6.25 ± 1.62	5.08 ± 1.37	0.0001
sbp (mmHg)	154.32 ± 10.92	109.68 ± 6.11	0.0001
Dbp (mmHg)	104.82 ± 10.74	73.10 ± 3.45	0.0001

DISCUSSION

In the present study the mean age of patients in hypertension group and control group is 54.01 years and 43.86 years respectively. There is a statistically significant increase in the age of hypertension group. The results of our study are similar to the study done by Padalkar RK et al,^[7] who studied the Impact of Serum Uric Acid and Vitamin D on Essential Hypertension. Kar A and Datta S⁸ in their study of serum Vitamin D level and its association with hypertension reported mean age of hypertensive patients and controls to be 53.24 years and 46.75 years. Divyen K et al⁹ in their Study of Evaluation of Role of Serum Uric Acid Levels in Cases of Essential Hypertension reported mean age of hypertensive patients and controls to be 54.6 years and 49.6 years respectively. Both the studies reported increased mean age in case of hypertensive patients as compared to controls.

The male to female ratio in hypertension group is 1.3:1 and male to female ratio in control group is

2:1. Males were significantly more in number as compared to females in both the groups. The findings of our study are concordant with the study done by Padalkar RK et al,^[7] Kar A and Datta S8 and Divyen K et al⁹ who also reported increase in number of male patients as compared to females.

The mean fasting blood sugar of patients in hypertension group is 87.19 mg/dL and means fasting blood sugar of control group is 85.73 mg/dL. Fasting blood sugar level of hypertensive group is significantly higher than the control group. In 2003, the American Diabetes Association (ADA) Expert Committee recommended the diagnostic cut-off value for impaired fasting glucose to be 100 mg/dL.^[10] Fasting blood sugar is within normal range in both the groups.

The mean HbA1C of patients in hypertension group is 5.96% and means HbA1C of control group is 5.89%. This difference is considered to be not statistically significant. Nondiabetes usually falls within the 4.0%–5.6% HbA1c range. The prediabetes usually has the HbA1c levels as 5.7%–6.4%.^[11]

The mean urea level of patients in hypertension group and control group is 25.24 mg/dL and 23.29 mg/dL respectively. Mean urea level of hypertension group is significantly higher than the control group. The mean serum creatinine level of patients in hypertension group and control group is 0.71 mg/dL and 0.66 mg/dL respectively. Mean serum creatinine level of hypertension group is significantly higher than the control group.

The elevation of serum urea and creatinine may be relevant to the decreased glomerular filtration rate as a result of hypertension effect on renal function. Decrease in renal blood flow results in decrease in glomerular filtration rate this leads to decrease in distal tubular flow rate which leads to increase in urea reabsorption and decreased secretion which may be the reason of elevated serum urea concentration in hypertension group. The elevation of serum creatinine concentration in hypertension may be attributed to the decrease in creatinine clearance due to decrease in glomerular filtration rate. Creatinine clearance rate determines how efficiently kidneys are clearing creatinine from the blood.^[12]

The mean serum Vitamin D level of patients in hypertension group and control group is 20.97 ng/mL and 38.70 ng/mL respectively. Mean serum Vitamin D level of hypertension group is significantly lower than the control group. The results of our study are in concordance with the studies done by Padalkar RK et al,^[7] Kar A and Datta S8 and Vatakencherry RJ and Saraswathy L,^[13] who reported decreased levels of Vitamin D in hypertension group.

Vitamin D plays a key role in parameters that regulate high blood pressure via proliferation of vascular smooth muscle cells, endothelial cell

function, regulation of renin-angiotensin aldosterone pathway, and in regulation of blood pressure via increased intracellular calcium leading to decreased renin activity.^[13]

There are studies which showed widespread prevalence of Vitamin D deficiency in India.^[14,15] Poor sun exposure due to modern lifestyle, vegetarian diet, skin pigmentation, and cultural practices may be the reasons for this high prevalence in our population. Vitamin D is synthesized when the UV rays from the sun fall on the skin. Till recently, it was believed that Indians had sufficient amount of Vitamin D. Since Indians are now confined to more indoor jobs, and thus less sun exposure, most of us are now Vitamin D deficient. Absence of sunlight hits production of vitamin D in the body, adversely affecting blood pressure. Salt intake, smoking, obesity and genetics are now considered as the contributors for hypertension. In the coming years, Vitamin D deficiency may be included as a fifth contributor for hypertension.^[13]

The mean serum uric acid level of patients in hypertension group and control group is 6.25 mg/dL and 5.08 mg/dL respectively. Mean serum uric acid level of hypertension group is significantly higher than the control group. The results of our study are in concordance with the studies done by Padalkar RK et al,^[7] Neki NS et al,^[16] Shrivastav C et al,^[17] Charles BA et al,^[18] who have demonstrated that hyperuricemia influenced the development of hypertension via its role in vascular endothelial cell dysfunction and activation of renin-angiotensin aldosterone system.

CONCLUSION

Thus, it can be concluded from the present study that, the essential hypertension is associated with abnormalities in the level of serum uric acid and Vitamin D. We found that there is definite relation in serum uric acid levels between hypertensive patients and normotensive patients and serum uric acid levels have direct relation with hypertension. Because of association of Vitamin D deficiency and increased risk of hypertension, its supplementation may play key role in controlling high blood pressure and to prevent further complications. The study also concluded that, serum uric acid and Vitamin D can be used as biochemical markers to determine the severity of hypertension and it may be beneficial for better management and for developing new treatment strategies.

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How to cite this article: Aloona SP, Singh T, Sharma BR, Neki NS. Study of Serum Uric Acid and Vitamin D Levels in Essential Hypertension. *Ann. Int. Med. Den. Res.* 2020; 6(2):ME46-ME49.

Source of Support: Nil, **Conflict of Interest:** None declared